# Volunteer Lake Assessment Program Individual Lake Reports

## FOREST LAKE, WHITEFIELD, NH

**MORPHOMETRIC DATA**

| | | | | | |
|---|---|---|---|---|---|
| **Watershed Area (Ac.):** | 1,250 | **Max. Depth (m):** | 6.4 | **Flushing Rate (yr$^{-1}$)** | 1 |
| **Surface Area (Ac.):** | 192 | **Mean Depth (m):** | 2.8 | **P Retention Coef:** | 0.75 |
| **Shore Length (m):** | 3,500 | **Volume (m$^3$):** | 2,204,000 | **Elevation (ft):** | 1106 |

**TROPHIC CLASSIFICATION**

| Year | Trophic class |
|---|---|
| 1990 | MESOTROPHIC |
| 2005 | MESOTROPHIC |

**KNOWN EXOTIC SPECIES**

**The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm**

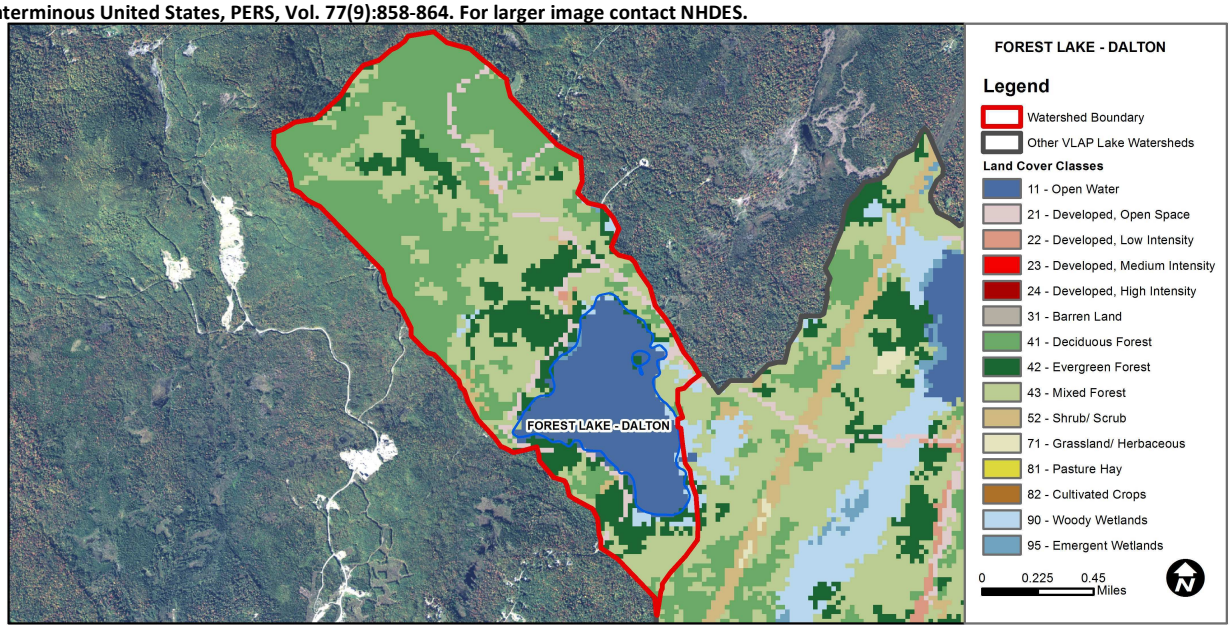
| Designated Use | Parameter | Category | Comments |
|---|---|---|---|
| Aquatic Life | Phosphorus (Total) | Good | The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator and the chlorophyll a indicator is okay. |
| | pH | Slightly Bad | >10% of samples exceed criteria by a small margin (minimum of 2 exceedances). |
| | Oxygen, Dissolved | Good | There are at least 10 samples with one, but < 10% of samples, exceeding criteria. |
| | Dissolved oxygen satura | Good | There are at least 10 samples with one, but < 10% of samples, exceeding criteria. |
| | Chlorophyll-a | Good | The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator. |
| Primary Contact Recreation | Escherichia coli | Good | There are geometric means and all geometric means are < geometric mean criteria; and there has been a single sample exceedance. |
| | Chlorophyll-a | Very Good | There are a total of at least 10 samples with 0 exceedances of indicator. |

**BEACH PRIMARY CONTACT ASSESSMENT STATUS**

| | | | |
|---|---|---|---|
| FOREST LAKE - FOREST LAKE STATE PARK | Escherichia coli | Very Good | Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria. |

**WATERSHED LAND USE SUMMARY**

**Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.**

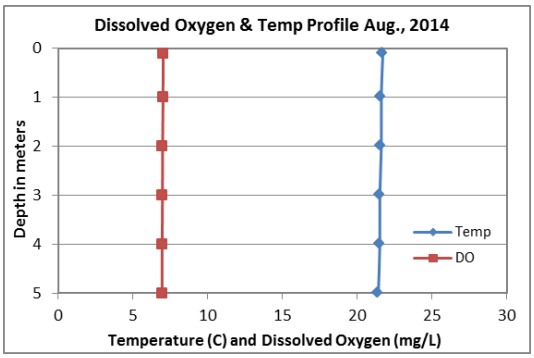


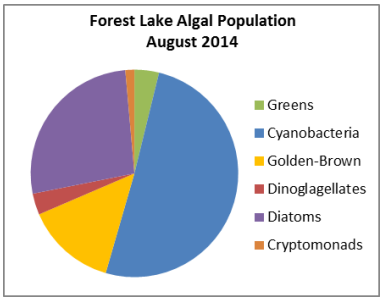

| Land Cover Category | % Cover | Land Cover Category | % Cover | Land Cover Category | % Cover |
|---|---|---|---|---|---|
| Open Water | 17.1 | Barren Land | 0 | Grassland/Herbaceous | 0 |
| Developed-Open Space | 3.91 | Deciduous Forest | 34.75 | Pasture Hay | 0 |
| Developed-Low Intensity | 0.1 | Evergreen Forest | 13.03 | Cultivated Crops | 0 |
| Developed-Medium Intensity | 0 | Mixed Forest | 26.84 | Woody Wetlands | 1.6 |
| Developed-High Intensity | 0 | Shrub-Scrub | 0.94 | Emergent Wetlands | 0.23 |

# Volunteer Lake Assessment Program Individual Lake Reports
# Forest Lake, Whitefield
# 2014 Data Summary

**Observations and Recommendations** (*Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **Chlorophyll-a:** Chlorophyll levels were low in August and less than the state median. Historical trend analysis indicates relatively stable chlorophyll levels with moderate variability between years.
- **Conductivity/Chloride:** Deep spot and tributary conductivity and chloride levels were relatively low and approximately equal to the state medians. Historical trend analysis indicates stable epilimnetic (upper water layer) conductivity since 1994.
- **E. coli:** Inlet, Sundman Cottage and Wright Cottage E. coli levels were low and much less than the state standard for surface waters (406 cts/100 mL). State Beach Brook E. coli levels were elevated following the removal of a beaver dam in July. August sampling at State Beach Brook revealed E. coli levels had returned to low numbers.
- **Total Phosphorus:** Deep spot phosphorus levels were low and stable from the epilimnion (upper water layer) to the hypolimnion (lower water level). Epilimnetic phosphorus levels increased slightly from 2013 but remained less than the state median. Historical trend analysis indicates significantly decreasing (improving) epilimnetic phosphorus since 1994. North Inlet phosphorus levels were slightly above average for that station, but not elevated. State Beach Brook phosphorus levels were elevated in July prior to the beaver dam removal and greatly elevated post beaver dam removal. This station has a history of fluctuating and elevated phosphorus levels which can be detrimental to lake water quality. State Beach Brook phosphorus levels remained elevated in August.
- **Transparency:** Transparency was low in August and field data note that a significant storm event occurred prior to sampling. Field data also note that the water appeared cloudy and turbid. Transparency was the lowest measured since 2000. Historical trend analysis indicates highly variable transparency since monitoring began.
- **Turbidity:** Deep spot and North Inlet turbidities were elevated in August following the significant storm event. State Beach Brook turbidity was slightly elevated prior to the beaver dam removal and greatly elevated following the beaver dam removal and exceeded the state standard for turbidity. State Beach Brook turbidity returned to average levels in August.
- **pH:** Epilimnetic and hypolimnetic pH levels were within the desirable range 6.5-8.0 units, however historical pH levels have fluctuated below the desirable range. Historical trend analysis indicates highly variable epilimnetic pH since 1994.
- **Recommended Actions:** The removal of the beaver dam on State Beach Brook caused a plume of bacteria, sediment, and phosphorus to enter the lake. This can be detrimental to lake water quality and it is recommended that a beaver pipe or flow through device be installed through the beaver dam that will allow water flow through the dam. This should prevent flooding along the road as well as erosion of the State Park Beach. However, the increased frequency and intensity of storm events is also a concern, and if flow through the beaver dam is not maintained, flooding may still occur. With this in mind, it is recommended to increased the size (diameter) of the culvert underneath the road to allow for a larger volume of water flow, as well as utilizing a large diameter flow through beaver pipe, or installing multiple beaver pipes through the dam. There are many resources available and companies that can assist with the installation of beaver flow through devices. This would likely be the most cost effective and environmentally friendly long-term solution. The significant storm event prior to the August sampling caused very turbid conditions in the lake as well as a brief cyanobacteria bloom indicating stormwater runoff may be affecting water quality. This highlights the importance of managing stormwater runoff into the lake. DES' "NH Homeowner's Guide to Stormwater Management" is a great resource.




**NH Water Quality Standards:** Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
**Chloride:** > 230 mg/L (chronic)
**E. coli:** > 88 cts/100 mL – public beach
**E. coli:** > 406 cts/100 mL – surface waters
**Turbidity:** > 10 NTU above natural level
**pH:** between 6.5-8.0 (unless naturally occurring)

**NH Median Values:** Median values for specific parameters generated from historic lake monitoring data.
**Alkalinity:** 4.9 mg/L
**Chlorophyll-a:** 4.58 mg/m$^3$
**Conductivity:** 40.0 uS/cm
**Chloride:** 4 mg/L
**Total Phosphorus:** 12 ug/L
**Transparency:** 3.2 m
**pH:** 6.6

| Station Name | Table 1. 2014 Average Water Quality Data for FOREST LAKE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Alk. mg/l | Chlor-a ug/l | Chloride mg/l | Cond. uS/cm | E. Coli #/100ml | Total P ug/l | Trans. m | | Turb. ntu | pH |
| | | | | | | | NVS | VS | | |
| Epilimnion | 8.5 | 2.90 | 4 | 40.3 | | 8 | 2.63 | 3.00 | 1.65 | 6.70 |
| Hypolimnion | | | | 43.9 | | 9 | | | 1.93 | 6.70 |
| North Inlet | | | | 44.1 | 10 | 14 | | | 1.67 | 6.83 |
| State Beach Brook | | | 3 | 44.3 | 95 | 62 | | | 10.52 | 6.42 |
| Sundman Cottage | | | | | 10 | | | | | |
| Wright Cottage | | | | | 10 | | | | | |

## Historical Water Quality Trend Analysis

| Parameter | Trend | Explanation | Parameter | Trend | Explanation |
|---|---|---|---|---|---|
| Conductivity | Stable | Trend not significantly; data show low variability. | Chlorophyll-a | Stable | Trend not significant; data moderately variable. |
| pH (epilimnion) | Stable | Trend not significant; data highly variable. | Transparency | Stable | Trend not significant; data highly variable. |
| | | | Phosphorus (epilimnion) | Improving | Data significantly decreasing. |